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OBSERVATIONS  
ON THE  
INCURVATIONS OF THE SPINE  
ARISING FROM  
SOFTNESS OF THE BONES,  
AND ON  
THEIR TREATMENT,  
PARTICULARLY IN REGARD TO THE FEMALE SEX:  
ALSO SOME REMARKS ON  
ABSCESSSES OF THE HIP-JOINT,  
AND ON  
INCURVATIONS OF THE SPINE FROM CARIOUS VERTEBRÆ.

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*Extracted from the Lectures delivered before the Royal College of Surgeons in London in the Summer of the Year 1820.*

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## ADVERTISEMENT.

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THE following Observations were delivered at the Royal College of Surgeons, as part of a series of Lectures on the Structure and Physiology of the Parts composing the Skeleton, and on the Diseases of the Bones and Joints of the human Body; which Lectures were subsequently published by Messrs. Burgess and Hill.

At the suggestion of the publishers, part of the fifth, seventh, and fifteenth Lectures, which treat on the Structure and Diseases of the Spine, are now reprinted. The author is anxious that every proper means of publicity may be given to a mode of treatment first suggested by Mr. Grant of Bath, and capable of being carried into effect by the natural powers of the patient being brought into regular action, and directed towards the removal of the deformity of the spine; and which, particularly in the female sex, he trusts

will render the application of instruments, which press on the pelvis, in all cases not arising from caries of the vertebræ, unnecessary.

In the Lectures given in Windmill Street, and in those delivered at the College, the author has produced most unequivocal proofs of the injurious, indeed sometimes fatal effects of such instruments. Many ingenious contrivances have been invented to remove weight from the spine; but most of these have been constructed to throw the weight so removed on a part of the pelvis not adapted by nature to its support, and which of course, when used, will tend to produce a distortion of that important part of the body, the perfect shape of which in parturition is so necessary to the lives of the mother and of the child.

To the reader who is unacquainted with anatomical terms, the description of the spine may not prove so intelligible as the author could have wished; but it will be recollected that the language in which such description is expressed was intended for those who had already studied the anatomy of the human body. He trusts, however, that whatever is expressed regarding the

nature of the disease, and the treatment which is best adapted for its removal, will be sufficiently intelligible to all persons who are interested in inquiries relative to such subjects. As these Observations are extracts from Lectures publicly delivered, and since published, the original language must be retained.

Some observations on Abscesses of the Hip-joint having been made in the same Lecture in which incurvations of the spine from carious vertebrae were mentioned, the author has caused these also to be reprinted.

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# OBSERVATIONS,

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## GENERAL OBSERVATIONS ON THE HUMAN SKELETON, AND ON THE PARTICULAR SITUATION AND CON- NEXION OF THE SPINE, PELVIS, AND THORAX.

To remedy those injuries which may happen from accidents, and to be enabled to cure the diseases which take place in bones, we must not only know their shape and structure, but also their particular connexion with each other. I shall perhaps, therefore, stand excused for prefacing the remarks intended to be made on the diseases of bones, by some general observations on their arrangement, motion, and uses, when they are combined and forming the skeleton.

The skeleton is well known to be an assemblage of those hard parts, which sustain and give general shape to an animal body. In animals of white blood, and which have no vertebræ, it is formed of shell and placed exteriorly. In animals possessed of vertebræ, it determines the proportion and form of the body, and, although not

situated externally, it often encloses the most important organs of the animal.

In the skeleton of the human body we find a structure, most admirably adapted to give firmness, support, and determined shape to the whole fabric, protection to those softer parts upon the regular and uninterrupted action of which life immediately depends, to afford levers to increase the powers of the muscles, and fixed points to limit, or give proper direction to their actions. To possess these qualities the skeleton must necessarily be composed of a number of bones; a few, even one, might have given support and determined shape; but many are necessary when strength and motion are combined \*.

In the view which it is proposed now to take of the skeleton, I shall begin with the trunk, as the basis of muscles and muscular action, upon which the head and other extremities move, and to which they are affixed; considering it also as the largest, strongest, and most immovable part, on which the others, although perfectly distinct from each other, are entirely dependent.

It has been most satisfactorily proved, by the attentive observation and comparison of the form of the human skeleton with those of animals most

\* In the original publication, observations are here introduced on the comparative size of the skeletons of different individuals, and on the strength, thickness, &c. of the bones composing them.

nearly resembling man, that the natural attitude of the human figure, in a state of progression, is erect; and that it is not so in other animals. Among the many peculiarities proving this, the form and shape of the human spine are the most strikingly remarkable; for, in the erect position the spine becomes a pillar of support, bearing the incumbent weight of the thorax, upper extremities, and head, and for this reason is largest at the bottom, where the most weight is to be supported. Indeed the size of the lumbar vertebræ and sacrum, being greater in proportion to the rest of the bones of the spine than in any other animal, and thus being adapted to support the increased weight, is sufficient to prove that the upright position is natural to man. The spine forms a chain of bones connecting together the pelvis, thorax, and head; like the keel in a ship, making one whole of the several component parts of the skeleton; supporting the weight of the body in the upright position, and in the recumbent preventing the trunk from being lengthened. The bones of the spine are so generally found, and are so important, that they give a name to the most numerous and perfect class of animals, *viz.* vertebral animals.

In the admirable structure of the human spine, we have two most important qualities combined; these are, strength and flexibility. It possesses this advantage, from consisting of several bones,

so connected, that the degree of motion between any two is much limited; but the motion diffused through the whole is extensive and in every direction.

The bones which compose the spine support, lodge, and protect the spinal marrow; the spine having a canal for this purpose extending throughout its whole length, with perforations on each side between the vertebræ, to allow of the nerves passing out. The numerous joints of this structure prevent the spinal marrow from being overstretched, or compressed during the motions of the trunk, which would have happened at some particular part, had much bending motion been permitted between any two of the vertebræ; but as it is, the curvature must be regular and gentle, from being divided among so many bones.

To increase the strength and to limit the motion, there is a double articulation between each vertebra; one connecting the bodies of the contiguous vertebræ, and another connecting their articulating processes. In the loins, the surfaces of contact between the bodies of the vertebræ are flat and broad; and the lower articulating processes of each vertebra, being placed nearer each other and being convex, are received between and into concavities of the upper articulating processes of the vertebra below. In the back, the bodies are placed nearly horizontal, but the surfaces of

contact between them are less than in the loins; and the articulating processes are nearly perpendicular, the under being placed behind the upper articulating processes of the vertebra below. In the neck, the lower part of the body of each vertebra, excepting the first, is shaped like a wedge, and is received into a corresponding concavity in the vertebra next to it, and the articulating processes are placed very obliquely.

The sacrum and *os coccygis*, forming part of the pelvis, are not concerned in the rotary motion of the trunk. I have already stated that the sacrum is much larger, in proportion to the other vertebræ, in the human spine than in that of any other animal. This arises from the nature of its junction with the *ossa innominata*; it has to bear the weight of the parts above it in an unfavourable direction, viz. a transverse one; it is therefore formed proportionably large and strong. Its triangular shape, and the wedgelike articulation with other bones forming the ring of the pelvis, add to its strength; and while its concavity before and below increases the capacity of the hollow of the pelvis, its convex and projecting posterior and upper surface is admirably adapted to allow of origin to strong muscles, which ascend to support and give motion to the vertebræ forming the column above it.

The *os coccygis* consists of five small bones,

in the human skeleton ; but in quadrupeds, there are many bones below the sacrum, viz. all that form the tail.

In the quadruped these bones are continued in the same line with the spine ; but in the human body, the sacrum and os coccygis bend forwards so as to assist in supporting the pelvic viscera when the body is seated, or when they are forced downwards by the muscles of expulsion. Had the sacrum and os coccygis proceeded in a direct line from the spine, they would have projected beyond the tuberosities of the ischia, and therefore would have prevented the weight of the body, when in a sitting posture, from being conveniently supported, at it now is, on those parts.

Although the motion is very limited between two contiguous vertebræ, the upper part of the spine, from the number and nature of the joints, possesses much motion, and that very varied. The bones of the spine are connected to each other by strong external ligaments, and the under and upper surfaces of their bodies by the elastic intervertebral substance, the solidity of which diminishes gradually from the circumference to the centre, so that it becomes nearly fluid and incompressible in the middle ; thus allowing, but limitedly, all the motions of a ball and socket joint, viz. a gentle bend in every direction, as well as a degree of rotary motion. This structure also

breaks the force of any jar, by gradually yielding to it, and from the elasticity it possesses, always tends to restore the vertebral column to the natural erect form. During the day when the body is erect, this intervertebral substance, yielding a little to the weight thrown on it, diminishes the height in the adult person rather more than a quarter of an inch ; but this is recovered during night, when the body is recumbent.

The articulating processes, having sliding cartilaginous surfaces, limit the motion in certain directions, and, by so doing, add much to the strength of the whole chain. When we bend forwards, the upper moved part is supported entirely on the bodies of the vertebræ ; when we bend backwards, the articulating processes support much of the weight ; when we incline to one side, the weight is supported partly by that side of the bodies, and partly by the articulating processes of the same side ; but the erect position is the surest, as, to maintain that, all these parts assist.

The transverse and spinous processes are admirably contrived for giving an advantageous insertion to those muscles which are to keep the spine erect, and occasionally to bend it. The transverse processes also afford buttresses of support to the ribs. The hollows between the spinous processes and the angles of the ribs are filled up by the powerful muscles just now alluded to ; and I

shall have occasion, when on the curvature of the spine from rickets, to prove, that the regular action of these muscles, when properly excited, will do more, and with much more safety, towards removing or lessening the incurvation, than all the instruments which have ever been invented.

Between the dentata and atlas there is no intervertebral substance; but a pivot extends upwards from the dentata, on which the atlas moves round and carries the head with it; between these two vertebræ there is therefore more rotary motion, than between the whole of the others combined. The joint is one of the most beautiful construction, and permits of the head being turned more expeditiously to either side, than could have been effected by any other contrivance; and is so strengthened by various ligaments, as to admit of dislocation by no common accident; for, should the pivot be driven from its proper situation, so as to press on the spinal marrow at this part, the derangement would be attended with death.

The great length of the transverse processes of the atlas, affords a very advantageous insertion to the rotary muscles of the head. The atlas has no spinous process; for this process would have prevented rotation, by projecting between the muscles; or would have torn them in the attempt to produce it.

The surfaces of the corresponding articulating

processes of the dentata and atlas are flat, to enable them to slide on each other in the rotation of the head; the capsular ligament connecting them is consequently loose. The superior articulating processes of the atlas, although nearly horizontal, are very concave, to receive the condyles of the occipital bone, and rise high on their external brims, for strong connexion with the head. This rise prevents all rotary motion of the head on the atlas.

Besides the external and capsular ligaments, there is a strong ligamentous membrane, which lines the inner surface of the vertebral canal, extending the whole length of the spine.

Between the roots of the contiguous spinous processes, there is a particular elastic ligament, the state of which is quiescent when the spine is in its natural shape; this ligament, therefore, tends to restore that shape when the spine has been bent, and, by so doing, renders less muscular exertion necessary. In quadrupeds, where the spine is horizontal, this ligament is large and strong, and assists in keeping the head from falling to the ground.

In the beautiful and elegant curvatures of the human spine, we can readily perceive how admirably each is adapted to its use. In the pelyis, the spine is hollowed in the front to contain the viscera, and projects behind to increase the power

of the long muscles of the back. In the loins, it projects forwards, for the purpose of balancing better the weight of the body, throwing the pillar of support immediately over the centre of gravity rising between the thighs; as a secondary use, this projection supports the large blood-vessels and viscera of the abdomen; as the spine ascends, it makes a sweep backwards, and becomes more flattened on the sides, to give room for the heart and lungs: this curve, with the two scapulæ and muscles belonging to them, projects considerably behind the centre of gravity.

It again bends forwards so as to become in the neck immediately in a line with the loins, thus balancing the weight of the body, and affording support to the œsophagus and blood-vessels of the neck and head. It passes a little backwards before its termination, for the proper articulation with the head, which is fixed on its upper extremity.

The deviations from these natural curvatures are not unfrequent; many of them being dependent on causes which may be removed, they will be noticed afterwards with other parts of the skeleton which are affected by their bend. I have dwelt on the natural structure of the spine perhaps too long; but it was, that the surest and simplest means of removing these deviations might be better understood.

The term pelvis is applied to the strong irregular ring of bone situated at the lower part of the trunk; and when the bones forming it are removed from the rest of the skeleton, and placed horizontally on a flat surface, a little forcing of the imagination may conceive that they then bear some resemblance to an antique basin; but the term would more strictly apply to the appearance of the cavity between the bones, when bounded by the peritonæum, and viewed from the opened abdomen; for, when thus viewed, the sides and bottom, as in a basin, run gradually and so imperceptibly into each other, that no precise boundary shows where the one ends or the other begins.

As a ring, the pelvis possesses more strength for its extent, with a less quantity of bony matter, than it could have done in any other shape. It is in fact the strongest part of the skeleton, and the necessity why it should be so appears, when we consider, that in the erect position of the body, the weight of the thorax, head, and upper extremities is supported by the sockets of the thigh-bones, which are situated in its sides, and when we are seated, by the tuberosities of the ischia; for the extremity of the spine is but little pressed on in this position.

The pelvis is also the part to which the lower extremities are connected, and from its shape as a ring it allows of fixed points for the muscles de-

scending from it to surround these extremities and move them in any direction; and also to muscles ascending from it on the trunk, which move the spine and thorax in all directions. It thus may be considered as the great centre of attachment for the voluntary muscles.

By its hollow form it supports and contains some very important viscera.

The aperture at the upper and fore part communicates with the general cavity of the abdomen. The aperture at the under and back part, is partially closed by muscles and ligaments, which assist in supporting and protecting the contained parts; but which leave sufficient space for the termination of the larger excretaries; viz. the bladder and rectum in both sexes, and in the female the uterus.

In the erect position of the body the pelvis is situated obliquely; the opening towards the abdomen looks upwards and forwards so much, that a line drawn through its axis would approach considerably nearer a horizontal than a perpendicular direction; and would strike on the apex of the os coccygis. The excretaries therefore terminate before and below this line, as the cavity of the pelvis projects downwards and backwards from that of the abdomen. That part of the pelvis which is in front when the body is seated, becomes in the erect position the lower part; thus the viscera rest on,

and are supported by the ossa pubis, rather than on the soft parts which bound the lower and posterior aperture: in advanced pregnancy, the advantages arising from this are obvious. In quadrupeds, the cavity of the pelvis is in the same line with that of the abdomen; and from the horizontal position of the trunk, no inconvenience arises from this.

From the oblique situation of the pelvis the thigh-bones are so joined to it, that the line of support in the trunk coincides with that in the lower extremities. Had the axis of the pelvis been perpendicular, the thigh-bones being connected with the middle of its sides, and the spine being attached to the back part only, the body would constantly have been inclined backwards by its own weight; but as it is, in the erect attitude, the spine becomes a pillar of support, rising through the centre of gravity, and extending over and above the articulation of the thigh-bones. This oblique situation of the pelvis should always be remembered in examinations of the diseases connected with it, and in the operations which may be required for their removal. From the pelvis being frequently viewed when in a detached state and placed on a table, a wrong impression is often acquired of its true situation in the skeleton, and the terms anterior and posterior, which seem to have been applied to it and to the parts belonging to it in such artificial position, increase the difficulties

arising from this impression, so as sometimes, in the necessary examinations of the natural and diseased parts by the introduction of the finger into the excretory passages, and in the use of instruments in operations, to have produced very serious mistakes. We should therefore recollect that the position of parts usually called anterior, is also inferior, and that called posterior is also usually superior. From the recollection that a line drawn through the axis of the pelvis in the erect position of the body approaches nearer to a horizontal than a perpendicular direction, the true situation of the pelvis, in regard to the rest of the skeleton, in any position of the body, need never be mistaken.

The pelvis rises high at the sides: these lateral projecting parts give support to the abdominal viscera, and allow of attachment to the strong muscles which move the thighs and trunk. Had the edge of the pelvis projected equally on the fore part, the cavity of the abdomen could not have so readily accommodated itself to the alteration in size which its viscera must occasionally undergo; as the bladder when full or empty, the uterus whether gravid or not, or the intestines when distended or contracted.

The ossa innominata are very wide in the human skeleton, and give origin to the strong and thick glutei muscles, which, covered by fat, form the hips, and constitute a marked difference between

man and the animals which approach nearest to him in shape, and thus assist in proving that the erect and sitting attitudes are peculiar to the human race. The tuberosities of the ischia project for muscular attachment, and are rounded for supporting the body when seated; the larger glutei muscles passing over them, form a convenient cushion for the more easily enduring the pressure of the weight. They also give attachment to two of the strong sacro-ischiatic ligaments, which form the bottom of the ischiatic notches. The spines of the ischia give attachment to two nearly similar ligaments. These ligaments connect the ossa innominata to the sacrum, and are more convenient and safer in doing this than bone would have been; for, by yielding a little to any force suddenly and violently applied, they lessen the chance of the bones being fractured, and in parturition they may on some occasions facilitate delivery. Similar observations will apply to the articulation of the ossa pubis at the symphysis; but in a more marked degree, as between these bones there is a connecting medium not very unlike that between the bodies of the vertebræ, viz. a substance consisting of smooth cartilage in immediate contact with the surfaces of the bones, but becoming fibrous nearer the middle; I have often seen a cavity in the centre containing a substance nearly fluid, and there is a large proportion of cartilage at the under part. All this

connecting structure is covered by strong ligaments.

The great sciatic notches afford convenient openings for the larger trunks of nerves and blood-vessels to pass through, which supply the back parts of the lower extremities. The foramina thyroidea between the ischia and pubes, allow the pelvis to possess more surface and strength, with a less quantity of bony matter and weight. They are filled up by ligaments which afford extensive surfaces for muscular attachment, and by so doing produce a saving of bone, for bone seems to be formed with more difficulty than ligament.

The acetabula are situated on the sides of the ossa innominata, near the under part, and are much deeper in the fresh body than they appear to be in the skeleton ; their edges are rendered prominent by a quantity of elastic ligamentous cartilage, which structure increases the strength of the joints, and lessens the chance of the edges of the acetabula being on any occasion broken off. The acetabula have a deficiency of bone on their inner edges, but in the fresh body the ligamentous cartilage extends all round each, leaving a hollow underneath it, in which the fatty substances belonging to these joints play ; and this structure allows to the thigh-bones more latitude of motion inwards than they could have had if the edges of the acetabula had been bony all round.

The only decisive marks by which a female skeleton may be distinguished from that of a male are to be found in the pelvis, and arise from the obvious cause of the female possessing a proper frame to become a mother. The bones of females generally are smaller, more delicate, and the muscular impressions are less distinctly marked on them than on the bones of males; but these differences are accidental, and may be met with in men as well as in women, as in those of a slender make, and who have not been in the habit of using laborious exercise; while those of women accustomed to hard labour are strong and well marked.

The pelvis of a male appears stronger, thicker, and much more clumsy than that of a female; it contains more osseous matter: this, indeed, holds respecting all the bones, but not in so great a degree.

The pelvis of a female, at and below the linea innominata formed by the lower part of the inside of the os ilium and ridge of the pubes, is much more capacious from side to side than in the male. The entrance or brim of the cavity is also more oval, the greatest diameter being from side to side. In the male it is more triangular, and the greatest diameter at the brim is from the fore to the back part. There is not much difference in the breadth of a male and female pelvis belonging to skeletons of nearly the same height, if measured from the

anterior part of the spine of the ilium to the corresponding part of the opposite side; the difference in breadth is chiefly confined to the basin-like part of the cavity. The symphysis pubis is broader in the female, and the angle underneath it is much more obtuse; the space between the descending rami of the pubes is consequently larger. The sacrum is broader and turned more backwards: this also adds to the capacity of the cavity. The os coccygis is more moveable and much less bended forwards. The tuberosities of the ischia are farther distant from each other and from the os coccygis; and as these three points are farther asunder, the notches between them are consequently wider, and there is of course a much greater extent of space between the os coccygis and pubes.

In consequence of the cavity of the pelvis being wider in women, the superior articulations of their thigh-bones must be farther removed from each other; this occasions their peculiarity in walking; as they have more trouble to preserve their centre of gravity from falling too much to one side when the leg is raised.

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#### ON THE THORAX.

The thorax, in addition to the twelve dorsal vertebræ, is well known to be composed of twenty-four ribs and the sternum.

In shape it forms a flat irregular cone, adapted to the important viscera contained within it, as well as to the attachment of muscles belonging to the upper extremities, and the head. This shape is also convenient and necessary for the motions which the ribs possess in respiration.

The size and form of the cavity of the thorax cannot be known by viewing the entire body; for the muscles attached to the arms, give an appearance of breadth to the upper part of the trunk, which the cavity does not possess. The cavity is very narrow above, it widens as it descends; it is the least deep on the fore part, corresponding there to the length of the first and second bones of the sternum; behind, the depth is greater, as it answers to the extent of the twelve dorsal vertebrae; and the cavity is still deeper at the sides from the obliquity of the ribs.

The narrow part of the cone is open above, to allow the trachea and œsophagus to pass into the thorax; also to give passage to the important blood-vessels belonging to the upper extremities and the head. The thoracic duct likewise passes through it, as do the nerves which supply the vital viscera of both the cavities which are situated in the trunk.

The viscera contained in the thorax cannot, without danger, be exposed to pressure, nor can their actions be long interrupted without endan-

gering the loss of life; nature, therefore, in placing the heart and lungs in a bony cage, has protected them from injuries which might arise from common accidents, and has made the bones forming this cage subservient to respiration, by giving them such shape and connexion, as to render their motion capable of enlarging and diminishing the cavity of the thorax; and has formed their surfaces smooth on the inside, to admit of the viscera possessing a free and sliding motion in this and other actions.

The ribs are crooked bones, extending obliquely from the sides of the spine to the middle line of the body before, and consisting of two parts, each bone having a cartilage of some extent added to its anterior extremity. The cartilaginous portions of the ribs, with the exception of those belonging to the first and twelfth, are placed so far in a different direction to the bony portions, that they ascend to join the sternum, while the bony portions descend as they pass forwards from the spine.

Besides the curve, each rib has a twist, which prevents it from touching a flat surface with its whole length at once. In making its curve, the rib is more bent at one particular place, which is called its angle; the rib passes backwards as far as the angle, and from this part it inclines forwards. The crookedness of the ribs decreases from the first to the last. The length and twist

of the ribs increase from the first to the seventh, and then both decrease. The angle, which in the first rib is placed where it leaves the spine, increases in distance from the spine until the ninth rib, it then becomes indistinct; in the middle ribs, the distance of the angle is about an inch and a half from the spine.

The seven superior, or true ribs, are fixed by their own cartilages immediately to the sternum. The five inferior, or false ribs, are not immediately continued to the sternum; but are attached, from the twelfth, successively to each other, and to the cartilage of the seventh rib. The greater degree of motion each true rib possesses, the longer is its cartilaginous portion.

One use of these cartilages is the prevention or lessening of any jar, affecting the bones, being communicated to the viscera; another is, preventing the ribs from being fractured, to which accident, by lying hollow, they must otherwise have been much subjected: a further use of the cartilages is, to restore the ribs to their natural position after they have been elevated or depressed in respiration. Each rib, with the exception of the first and last, is articulated in a socket formed by part of the bodies of two contiguous vertebræ, and it forms another joint with the transverse process of the lowermost of these: this process becomes a buttress of support to the rib, and pre-

vents it from being dislocated backwards when force is applied to the front of the chest.

The ribs are not continued to the pelvis; for, had they been so, they would have greatly interrupted, if not entirely prevented, respiration, the expulsion of the urine or faeces, the occasional increase of bulk in particular viscera, and the bending of the body forwards, or to either side.

The important action of respiration is performed by the muscles which move the ribs and sternum, and by the diaphragm. In respiration the ribs are raised, and the diaphragm is pressed downwards, by which means the cavity of the chest is enlarged. The elevation of the ribs may enlarge the cavity of the chest so much in inspiration, as to be sufficient to support life without the assistance of the diaphragm; and this sometimes is done in advanced pregnancies and dropsies, when the contents of the abdomen prevent the diaphragm from pressing downwards. The diaphragm also may effect a sufficient enlargement of the cavity of the thorax to support life, without the ribs; this sometimes happens in inflammations of the pleura, when the motion of the ribs adds much to the pain; to avoid which, the patient endeavours to keep the ribs at rest. We have a remarkable proof of the diaphragm having carried on respiration unassisted by the ribs, in a skeleton in our museum, where the whole of the

ribs are ankylosed, and must have been so a long time before the person's death. On all common occasions, however, the diaphragm and the muscles which raise the ribs, act together. The first rib is nearly fixed, and placed horizontally; the remaining ribs, as they pass forwards, incline in succession more downwards, so as to increase the breadth of the intercostal spaces by separating from each other. The muscles of inspiration raise the ribs, and at the same time turn their lower edges outwards: this motion elevates the lower part of the sternum, and carries it forwards: thus the whole transverse diameter of the chest is increased. If the ribs had not inclined downwards, but had passed horizontally from the spine to the sternum, they could not, by being carried upwards, have had any effect in enlarging the transverse diameter of the chest. The ribs rotate on the axis of their posterior extremities, which produces the effect of raising and pressing outwards the sternum at the lower part. The cartilages connecting the ribs with the sternum, must, by this action, be twisted to a small extent, and when the muscles which raised the ribs cease to act, their elasticity, endeavouring to regain their natural shape, depresses the ribs, consequently the lower part of the sternum is carried downwards and backwards, and the transverse diameter of the chest is lessened; in doing this, the car-

tilages are assisted by the muscles of expiration. In strong expiration, these muscles depress the ribs much lower than the point to which the cartilages, from their elasticity, bring, and would leave them ; and when so, the muscles of expiration are opposed, instead of being assisted by the elastic property of the cartilages \*.

\* The observations made on the rest of the skeleton, in this abstract are omitted.

ON RICKETS AFFECTING THE BONES GENERALLY;  
BUT MORE PARTICULARLY AS AFFECTING THE  
SPINE AND PELVIS.

IN submitting to your consideration the following observations on the diseases and accidents happening to bones, and to those structures which are the most immediately connected with them, I request permission to remind you, that the Lectures in this theatre are not delivered to students who have every thing elementary in their profession still to learn, but to those who have been already instructed in its first principles; and that they are also listened to by Surgeons who have long been engaged in the practice of their honourable and useful art; that I feel it, therefore, most difficult, when addressing such an audience on any particular disease, to determine what are the circumstances relative to it, which I should either entirely omit or touch very lightly on, and what are those on which it might be expected that I should extend my remarks. Without some elementary observations, the account of any disease must be liable to misconception; but in this place to dwell on subjects merely elementary, or on the minutiae of practice, would be to underrate the acquire-

ments and waste the time of those who honoured the Lecturer by their attendance.

In every science it is only by the study of particular facts that we arrive at the knowledge of general and established principles. The preparations in our museum afford many and very valuable materials for observation on the nature of diseased structure in bones; but to make these observations useful, they must be connected with some principle.

Diseases in bone may arise either from a deficiency of some of the materials which should enter into its composition, or from some unnatural action taking place in its substance. Rickets is a disease of the first kind. From the derivation of the name, rickets might be supposed to affect the spine only; but no part of the skeleton is exempt from some alteration of structure or shape, when this disease has once taken hold of the constitution.

In rickets the bones lose their characteristic qualities of hardness and tenacity of form; for they bend under the weight which they were intended to support, or are rendered crooked by the effect of muscular action. In rickets the bones not only become softer; but sometimes, in very young children, they also become enlarged at their extremities near to the joints; this is more particularly observable at the wrists, and at the ante-

rior portions of the ribs : the last-mentioned symptom, however, is not so constant in young persons near to the age of puberty ; for, when they are attacked by this disease, the bend will often take place without much enlargement of the extremities of the bones.

This disposition shows itself in the early periods of life. The disease has taken place in the foetus while in utero; but the more usual period of its occurrence is between the seventh or eighth months and the end of the second year : from which it has been supposed by some nosologists to be connected with, or to be affected by, the first dentition. I have often known it make its primary appearance after this time. It not unfrequently affects the spine a little before the period of puberty, and it will also do this long after that period has passed. When it takes place after puberty, its effects are indeed usually confined to the spine, and considerable lateral incurvation of the vertebral column is produced in both sexes; but much more frequently in the female than in the male.

Rickets appears to be more connected with a scrofulous habit than any other; but its effects are distinct from those produced by scrofula. Like scrofula, it is found more frequently in cold, variable, and humid climates, than in those which, though cold, are not moist, or in those which are

warm and dry. In this climate the occurrence of rickets is so frequent, that it passes in some parts of Europe by the name of the English disease; and is described as having originated during the beginning of the seventeenth century in Dorsetshire and Somersetshire, and from these counties to have spread over the world. There is no real foundation for this absurd supposition of its origin, or even that it is a new complaint; for both Greecian and Roman authors have mentioned the kinds of deformity which the disease produces, as existing in their remote times. The disease had not been distinguished until the seventeenth century by any particular name from other affections which occasioned deformity of the limbs; but it probably has existed in every age, in similar climates to those in which we now find it.

The softening of the bones in rickets has been variously accounted for. It has been supposed by some writers on this subject to arise from an excess of acid decomposing the phosphate of lime; by others, from the constitution not providing enough of this material: some have imagined that it is produced by the absorbent vessels having a morbid disposition to remove too much of this phosphate after it had been deposited in the bones; others have supposed it to originate from the arteries of the bones being deficient in the power of secreting phosphate of lime from the blood, and thus not depositing it in sufficient quantity in their sub-

stance. But we possess no proofs of excess of acid, or of any acid whatever being generated; for none has been found peculiar to rickety patients by any chemical, or other tests yet known. In rickety constitutions there does not appear to be any deficiency of the phosphate of lime in the blood generally; for, in incurvations of the spine a redundancy of osseous matter is often pressed out on the bent side. This matter, in rickety persons, is sometimes deposited in large quantities in parts not intended to be bony, or even hard; and the urine of such persons is often found to be highly saturated with the phosphate of lime; moreover, the absorbents do not remove it when deposited on the surface of the bones, or in parts external to them and unconnected with them. All these circumstances give greater probability to the opinion which presumes that the arteries of bones are deficient in the power of separating the phosphate of lime from the blood, so as to deposit it in sufficient quantity in their substance, than that any deficiency of this material exists in the body.

It has been observed that the teeth are not affected by rickets, but remain hard when the jaws soften; this is generally so; but in one well-marked instance of rickets I found that the bony parts of the teeth were much softer than usual, although none of them had assumed any external signs of decay.

The alteration from health in the substance of rickety bones, appears to arise entirely from a deficiency in the deposit of the phosphate of lime. In the cancellated part, these bones sometimes become so soft that they can be divided with a common knife ; the cells which contain marrow are enlarged, and the parts which are usually the most compact, assume a cellular appearance ; when dried they are more transparent than other bones, and then show that they possess less saline matter, appearing as if they had been steeped for a short time in a weak acid. The preparations before us distinctly exhibit the general appearances found in rickety bones when sections of them have been made \*.

In children of an early age there are certain constitutional symptoms which clearly indicate when this disease is present ; but when it attacks later in life, it is marked more by the local affections it produces. In very young patients we generally find that the digestive powers are diminished, although the appetite is often good and even voracious ; the belly is swelled, there is a great degree of flatulency ; from the absorbent mesenteric glands being usually enlarged and in a scrofulous state, the absorption of the chyle is not perfectly

\* In this part of the Lecture the specimens of rickety bones were shown.

accomplished ; the body becomes emaciated, and the muscles more lax ; the countenance however is lively, the eyes are bright, and the intellectual powers of the child generally appear beyond what are usual at its years. This last circumstance has been attempted to be accounted for, on the supposition, that, from the softness of the containing bone, the brain would possess a more free circulation of blood, and be enabled to perfect its substance and actions more quickly, than when surrounded by an unyielding case, so that the different senses would sooner have their assigned places, and also the structure of their organs sooner completed. This mode of arguing is not supported by any analogy which can be drawn from the state of the cranium in other diseases where the mental powers are either increased or diminished ; and the fact may be more reasonably accounted for by the attention which the little patient requires, placing it in more constant association with persons older than itself, and having, from sympathy with its hapless state, a greater share of their conversation devoted to it : thus, as it cannot use the muscular powers, more opportunity and time are given for the exercise of the faculties of the mind. In some instances, however, of rickets, we do not find an increase of intellect, and in others the disease is attended with an evident diminution of it.

As the disease proceeds, the skin appears dry and scaly, the teeth become black and decayed; the weight of the body cannot be supported in any position without producing curvatures of the bones; the natural functions of the internal organs are interrupted, the lungs become tuberculated and consumptive, and hectic symptoms arise which are terminated by death.

The danger to life, for some deformity can seldom be prevented, arises from the number and situation of the bones affected by the disease. Rickets appears to be a disease of debility, and therefore is one which requires both medical and surgical attention. Nature often makes an effort to stop its progress; this effort should be carefully watched for, and, when discovered, seconded by our art. When the constitution is strengthened by good air, proper food, and other means, the disease will not only stop; but bones which have become crooked to a very great degree, will, without the use of any mechanical instruments, recover so as to become perfectly straight: of this I have witnessed many instances in patients between five and twelve years of age; and have often found, in cases where the bend in the bones remained, that their substance acquired greater hardness, and became stronger, than other adult bones.

I have for many years past, when treating on

this disease in my lectures on surgery, shown the providence and wisdom of Nature in depositing abundance of osseous matter, when the bones begin to recover from the disease, at the place where it is most wanted, viz. on the inner part of the concave surface of their curve. The preparation I now produce to you is one of those I have always shown to prove those facts \*.

In the museum of Dr. William Hunter there was the skeleton of an adult dwarf, whose bones bore evident marks of having been rickety early in life; but which at his death were more compact, and stronger, than any human bones I had ever met with: this person's strength, as he was in the habit of obtaining his livelihood by publicly exhibiting proofs of it, was known to be very great.

Dr. William Hunter, whose experience in the diseases of children was most extensive, recommended in rickets the constant use of those means which tend to strengthen the constitution; and he asserted that cold bathing corrected this habit more than any other remedy yet known; indeed that rickets, almost with certainty, could be prevented by the use of cold water; sea water, if the patient was near the sea, if not, spring water, the temperature of this being more constant than

\* Here a specimen was shown of a thigh-bone strengthened by a well-marked deposition of bony matter, preventing a farther curve.

that of river water, and the use of it generally bringing on a healthy glow. The children, he observed, should be dipped daily, and only once at each period; they should be dried quickly, and friction by coarse linen or flannel should be applied to their backs and limbs for a considerable time afterwards; that great attention should be paid to their breathing pure air of a regular temperature, to cleanliness, to wholesome food, and to the state of the digestive organs. Let me add, that I have seen this system acted on in many cases of rickets, in all with some, and in most with very decided advantage to the patient.

The usual effects of the disease on the different bones, are the following:—The skull is large in comparison to the rest of the skeleton, and the cranium forms a greater proportion of this enlargement than the bones of the face; it is also flattened at the top. The spine is incurvated laterally; but this affection will be noticed more particularly afterwards. When the cervical vertebræ are bent, the neck projects, and the head inclining backwards, appears sunk between the shoulders; from the curvatures of the spine the trunk is shortened, the ribs are flattened at the sides and much compressed together, and on the side to which the spine bends they form the projection or hump. The ribs are enlarged and thickened at their cartilaginous extremities; this, I have already stated,

is more observable in very young patients, than in those nearer to the period of puberty; their natural bend is altered, so that the chest appears more of a square than a conical form; the sternum projects, and is often broader than usual, but bent in its middle. In infants, the deformity of the chest is often increased by the pressure the children receive when supported in the nurses' arms. The ossa innominata have the spines of the ilia incurvated forwards, and are bent inwards where the ilia and pubes meet. The clavicles appear very crooked, and the scapulæ become shorter and more concave on their inner or anterior surfaces. The bones of the arms are bent outwards where the deltoid muscles are attached, and below this, sometimes, a little backwards. The bones of the fore-arms are rendered more hollow in the front from the action of the flexor muscles, and are sometimes bent in lateral directions; but the crookedness of the upper extremities, from the bones not necessarily supporting weight, is in general very considerably less than that of the lower extremities. The radius and ulna of each upper extremity appear to increase in thickness towards the joints, the radius particularly so at the wrist: the disease indeed often shows itself at first in such enlargement. It has been doubted, whether the appearance of enlargement of these bones at their extremities, did not arise from their

bodies being smaller than usual ; and it has been positively denied by some nosologists that they are enlarged at all. I have often found them soft and evidently enlarged ; but, as in the spunginess of the sternal extremities of the ribs, more frequently so in very young children, than in those more advanced and nearer to puberty. The bones of the carpus are softer and a little more spungy, but the metacarpal bones and the phalanges of the fingers are seldom much affected.

The bones of the thighs are curved forwards and outwards from the action of the muscles behind and on the inside, in addition to the weight of the body, the muscles regulating the direction of the bend. The necks of the thigh-bones, instead of obtuse, now form right, sometimes acute angles, with the shafts of the bones. The knees incline to each other ; the tibiæ and fibulæ bend forwards and a little inwards, so that the middle parts of the inner surfaces of both legs touch each other, but the feet are generally separated and thrown outwards. These are the usual directions of the curvatures, to which weight, and the actions of the strongest muscles of the limbs, naturally incline them ; but great variety will be found depending on accidental causes. It is not uncommon to find the tibiæ and fibulæ, when bent by this disease, to have become thinner in their bodies from side to side, but broader and flatter

from before backwards: this is more apparent when the bones begin to recover strength enough to resist any further bend. The bones of the feet are seldom much affected, unless a scrofulous disposition attends the rickety one.

The numerous specimens of this disease which I am enabled to lay before you, by giving you ocular demonstration of the effects produced by it on the different bones, will make a stronger and surer impression than any oral or written description of their altered appearance and form.

Many instruments have been invented to remove pressure from the bones of the extremities, and some of them are very judiciously contrived to produce that effect; but every surgeon must use his anatomical as well as mechanical knowledge in their application; for, when resorted to without this knowledge, they will often, indeed almost always, prove more injurious than beneficial. In very young children, instruments should never be applied to the limbs; they cannot be either necessary or useful, and by their weight, and by preventing exercise, they must tend to increase the general debility, and thus do much harm: their application; therefore, should be deferred until the bones of the trunk possess some firmness, and then be made only in cases where the larger bones of the limb, as well as those of the trunk, are hard enough not to be injured by their additional

weight, and the pressure necessarily made by them in correcting the distorted shape of the bones below.

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#### ON INCURVATIONS OF THE SPINE.

Incurvations of the spine so frequently happen, and in females are productive of so much more serious consequences than mere deformity, that the commencement of such affection, in that sex particularly, should carefully be guarded against; and when it has begun, the mode of treatment intended to remove it should be most attentively considered, and, when approved of, should not be delayed.

Incurvations of the vertebral column are of two kinds: one arising from rickets; in this the bend is usually to the sides; the other from caries of the bodies of the vertebræ; the bend in which is forwards. It is to the first of these incurvations that the following observations are intended to apply.

In females, before and sometimes after the age of puberty, the spine not unfrequently inclines to one side, and does so without any of the other bones exhibiting a rickety disposition. In a constitution merely weak, the habit of remaining long in some particular leaning attitude will often bring on this inclination, and in a rickety one will

always produce it. Thus a young person, devoting much time to learning an art, the exercise of which requires a peculiar position of body, as playing on the harp, the bones being soft, the sides of the vertebræ which are the most and longest pressed on become thinner, but project further outwards from the circumference of the column; while those which are less pressed on increase in thickness: there is no partial deficiency of the phosphate of lime on either side; but on the one to which the inclination is made the lime is added to the breadth or circumference of the bodies of the vertebræ, and on the other side to their thickness, or extent from above downwards.

When a bend has once been established, the superincumbent weight is thrown upon that part now in an unfavourable form for bearing it, and this of course increases the curve. Whenever there is a tendency to deviate from the perpendicular, the curve will continue to increase; or an attempt to counteract it, by a curve in another part of the spine and in the opposite direction, will take place. We thus find, that in rickets the spine is bent serpentine and laterally resembling the italic  $\S$ , and is not, as in caries of the vertebræ, bent suddenly and forwards; and we often meet with several of these lateral curves from the attempts successively made to support the weight more favourably by counteraction.

Although the spine is usually incurvated to one side in rickets, I have seen instances of the column being bent forwards in this disease, and the projection being directly backwards, as it is in caries of the bones. A well-marked instance of this kind is now in the museum attached to the anatomical school in Great Windmill Street.

As there are more than one curve, it is clear that the altered shape of the spine cannot be owing to the greater contraction of the muscles on either side; nor can it arise from a partial deficiency of bony matter, as a redundancy of it is pressed out on the weak side. It is therefore a fair inference, that the curve is produced by weight or pressure having been long or frequently applied to a particular surface of the bones, in constitutions, where although every part of the bones has an equal supply of the phosphate of lime, yet in all of them, that supply is less than in strong and healthy bones.

There are all the variations in this disease from the slightest bend, until the ribs, beyond their angles, being completely crowded together, come in contact with the spine, and, as I have already stated, are made to project by its pressure so as to form the hump. I have frequently known the spine curved to this extent, without the bones of the pelvis having been in the slightest degree affected, and where the persons have become the mothers

of well-formed living children. In the late Dr. Hunter's museum there were several trunks of this kind; and in the present collection of preparations in Great Windmill Street there are many of a similar nature; but in both collections, particularly in the one last mentioned, there are also several well-marked instances, where the bones of the pelvis are so distorted and bent inwards, that any unyielding body as large as a common-sized walnut could not pass between them; and where, when pregnancy had taken place in the persons they belonged to, such event must have been attended with the inevitable destruction of the mother or child.

In addition to the preparations belonging to our College, I have brought some of those alluded to for your inspection. The preservation of such distorted parts of the skeleton affords most instructive lessons as to the propriety or impropriety of applying instruments; and, when they are applied, as to the parts on which pressure should be made.

The affection of the vertebral column often begins after the pelvis is fully and well formed, and therefore when it is not likely to be altered in shape, unless some constant and artificial pressure is made on certain parts of it. This fact in all cases of distortion of the spine in females, should never be forgotten or overlooked. In them, the

beginning of the incurvation of the bones of the back should most carefully be watched over; and I feel confident in asserting, that, if timely discovered and attended to, such incurvation may in general be removed or remedied without mechanical instruments being employed, or any other distressing and violent means being used; and that, by this early attention, the lives of many mothers and children may be saved, in cases where either mother or child, or perhaps both, must otherwise have perished.

In most of the cases of incurvated spine, it is for some deformity of the trunk that we are first consulted, the parent and the patient being ignorant of the more serious consequences which have been now alluded to. It has been perceived perhaps, that one shoulder is higher than the other; that one of the shoulder-blades projects more than the other, or that one of the breasts is fuller, placed higher, and more prominent than the one of the other side: for appearances of this kind the surgeon is consulted, and the spine perhaps is never suspected of being their cause; but when the spine is viewed, which it should immediately be, and carefully too, for the whole extent of its length, these derangements may in general be easily traced to one or more incurvations having taken place in its course; and we shall often have the mortification to find that these incurvations

have been much increased by stays, back-boards, and other pretended supports which had been most injudiciously applied for their concealment or cure.

Although the curvatures of the spine may be readily seen when the patient stands before us, and easily felt by passing our fingers along the spinous processes, we shall often find, that when she bends forwards without external support, the lateral curvatures will disappear; and also that when she is admonished to hold herself erect, and makes the attempt, she can immediately straighten her spine, and retain it a few seconds in its proper form: when this is so, we may entertain well-founded expectations of her complete recovery; and even when the spine cannot in either of the above attitudes be rendered perfectly free from lateral curvature, we need not doubt of being able to arrest the progress and lessen the effects of the disease, by calling the natural powers of the body into proper action.

It is not necessary to remind this audience of the wonderful and beautiful mechanism of the spine, and of the strength and motion it possesses from the combination of many bones; nor that masses of muscles attached to it are placed between the spinous and transverse processes of the vertebræ and the angles of the ribs, which assist it in supporting the weight of the head and

upper extremities, and in varying the position of the trunk. It is well known to all present that these muscles are originally formed equal in power on each side; and that on each side they are equally employed to support the spine in the natural erect position of the body.

It is by calling these muscles into regular and frequent action, that the spine is to be restored to its natural shape and form, in cases where, from weakness or rickets, that form has been altered.

Several very complicated, and some ingenious instruments have been invented for taking off the weight of the head and upper extremities from the spine; and were this the only thing they accomplished, they, in many cases, might prove useful; but they throw the weight elsewhere, and on bones which, as well as the spine, may and do bend under it. In the application of all the instruments that I have seen, which would admit of loco-motion to the body, the weight, although removed from the vertebral column, has been thrown upon the pelvis; either professedly so, or in a way a little disguised; and as the bones of the pelvis are not so hard in such patients as in persons who have no rickety disposition, the upper part or spine of the ilium on each side, on which the weight is generally made to rest, is bent forwards; in consequence of which the pubes and ilia, where these bones form the fore-part of the brim of the pelvis,

bend inwards, and diminish the aperture of that cavity so much, that the head of a child cannot even enter it, which to be born naturally should pass gradually through it. The preparations which I now produce are frightful, but useful examples of this distortion of the bones of the pelvis\*.

I have examined very many cases of incurvated spines, happening in women in that class of life which would not permit of the purchase of expensive instruments, in which I have found the pelvises so perfectly well formed, as to have allowed of the birth of several living children, although the incurvation of the spines had been very considerable and long confirmed.

I have examined others, happening to women, where I had the means of ascertaining that instruments had been employed. In all of these, and in other cases, where, from similarity of appearance, I could not doubt but that instruments had been used, I found the bones of the pelvises irreparably injured, by having yielded to the additional burden thrown on them where they never were intended, and therefore were not calculated, even in a healthy state, to bear much weight. But the examination of the pelvises before us will speak more than volumes, and show most strongly the

\* Several pelvises were shown, and the injurious effects produced by the pressure of instruments demonstrated.

great advantages which may be derived to the public, from their being preserved in a museum like ours, where every person inclined to investigate the real nature of these diseases, and the merits or demerits of the different modes of treatment, may view and examine the altered state of the bones.

Such instruments as are fixed to parts not belonging to the body of the patient, as to chairs, or the ceiling of the room, may prove useful in forwarding the cure, by taking weight off from the spine when she is standing or seated; but when instruments act by pressing on the pelvis, they produce much more evil than by any possibility they can do good.

Placing the patient in a recumbent position on a horizontal plane, or one a little inclined, for a certain time every day, may assist in lessening the immediate cause of the curvature; and the couch on which she sleeps should be one which will preserve its level horizontal surface; a mattress, particularly a hair one, must thus be preferable to a feather-bed. When seated, the chair may have an upright back, but no elbows or arms to it, for these would form a partial rest, which might prevent the muscles of the spine from being called into equal action; and it is by this equal action that the cure is to be produced.

I here beg leave to acknowledge my obliga-

tions to Mr. Grant of Bath, for the first hint I received of curing lateral incurvations of the spine by the regular and uniform action of the muscles belonging to it, and for a detail of his opinions on this subject. In an accidental conversation, he informed me that he had proposed to cure these affections of the spine by placing a weight on the head of the patient, on the principle of producing frequent and equal action of the vertebral muscles; but that he seldom could convince, either the mothers, or even the medical men whom he had met in consultation, that by this weight he should succeed in effecting his object. His plan of treatment immediately struck me as founded on just physiological principles, and I told him that I had then a favourable opportunity of beginning a trial of it. On that very day I began the trial, and the event in three weeks exceeded my most sanguine expectations of success. Several years have passed since my conversation with Mr. Grant; but I have adopted the practice in very many instances during the last sixteen years, and in no instance, where it was properly persevered in, have I found it to fail in preventing the further progress of the disease, and in many I have witnessed it effecting a perfect cure, at least so perfect that no perceptible deformity remained, nor was any inconvenience in other respects suffered.

The simplicity of the means of cure I have, however, found to operate against a fair and sufficiently long trial of the plan being given. Some benefit has been received at first, with which the patients and relatives have been contented, and have not persevered longer than to arrest the progress of the incurvation; the bend has again increased; but on returning to the plan and persevering in it, a cure has still been effected. It is, therefore, necessary that the principle of the treatment should be fully understood by the patient and by those to whom the superintendence of the plan is to be intrusted.

This principle I have found to be soonest made intelligible to those who are not possessed of much anatomical knowledge, by the following illustration; viz. if a finger is held up, and bent a little, a weight being placed on its tip, either will bend it completely, or oblige it to straighten itself so as to be enabled to bear the weight when applied perpendicularly. Thus the spine being bent in one or more directions, when a weight is added to the head, it directly and almost instinctively, by the action of its own muscles straightens itself to bear that weight; and this action often renewed, and the position produced by it persevered in for a moderate time, will recover the spine from the bend that otherwise must necessarily have increased; or should an attempt

have been made to remove the curvature by instruments applied to the pelvis, their weight, and that of the body, must have altered and distorted that important part, the perfect shape of which is necessary, not merely to the symmetry, but to the life of the mother, or to the existence of her child at the period of its birth.

The weight should be used in the manner following: a small footstool, covered with a flat cushion, being inverted, may be placed on the patient's head: the hollow between the feet of the stool will allow of some substance, varying between four and ten pounds in weight (for it may be necessary to increase it to the last amount, although much less is generally sufficient), to be placed in it: the patient should be instructed to raise this footstool with both her arms, and support it on the crown of her head, elevating the spine at the same time towards the stool while held over her head; she then, preserving the most erect attitude she can, should walk in a straight line as soldiers are taught to march, and for a time not exceeding ten minutes; this should be repeated occasionally during the day. By degrees she will learn to balance the weight, and this regular exertion, giving the muscles their true action, will straighten the spine much more effectually and sooner than any mechanical instruments would effect\*.

\* Instead of an inverted footstool, I have found that a flat

The patient should be frequently reminded by her attendants to sit upright, for the momentary attempt to do this, even if the attitude cannot be long persevered in, will prove useful in forwarding the recovery. Negro women and basket women, who early in life have been accustomed to carry heavy burdens on their heads, are never crooked.

It is not to be expected, from the multiplicity of pursuits which must constantly engage the serious attention and occupy the time of a surgeon who is actively employed in his profession, that he can often personally superintend the use of the means now recommended : nor is it necessary that he should superintend their use otherwise than occasionally. From the anatomical and physiological knowledge which he possesses, he may, however, give proper instructions for that purpose to those whose daily habits and avocations place them frequently and for a long time in the society of the patient ; as the mother, governess, or some confidential attendant. And could our dancing-masters be induced to study and teach the healthy and natural, which are indeed the true graceful attitudes of the body, in addition to those that are termed elegant, but are often ar-

bag of a circular shape, made of leather or strong Holland, and filled with small shingles from the sea shore, answers better than any other contrivance I have yet met with. When shingles cannot be procured, dried pease or rice may be used.

tificial, much real good might be done by their assistance. Some of these gentlemen I am sure, when convinced of the present and future advantage this would produce to their pupils, would not hesitate to adopt, as part of their professional business, the superintending of that kind of exercise which would preserve the body in the most perfect shape, by exciting and keeping up the regular and equal action of some of its most important muscles; and it is with much pleasure that I find some of the best informed masters of that profession have lately adopted a plan of instruction founded upon the above-named principles.

Before this audience I should not have ventured to have delivered my sentiments so strongly as to the good effect of this treatment of incurvated spines arising from the softening of the bones, had I not, from repeatedly having witnessed it, been thoroughly convinced of its superiority to every other mode. If persevered in, those mischievous instruments which, by pressing on the pelvis, tend to the destruction of life, under the pretence of preventing the appearance of deformity, need never in such cases be had recourse to. In incipient curvatures, the plan of treatment I have now mentioned soon succeeds; where the curvature is great and has been long established, the time required will be proportionably longer.

Various other modes of exercising the chest and limbs in a regular, equal, and natural manner, will suggest themselves to every medical practitioner who has studied the formation of the skeleton, and the action of the principal muscles which are affixed to it and move its several parts upon each other. In pointing out these, and adapting them to the peculiar nature of the curvature and the patient's constitution, he may be of very great use in expediting the cure; he therefore should occasionally visit the patient during the continuance of the above-mentioned plan, to watch over its progress, and to aid the constitution in acquiring health and strength, by whatever other means his professional knowledge and experience warrant him to recommend.

When the patient or her friends can be made to understand the principles of the treatment, and how the muscles of the trunk can be brought into regular and equal action, the plan can be carried on without the farther assistance of the surgeon; but from the absurd opinions often entertained by those, who, having a little smattering of the knowledge of terms, would be conceived to know the whole *arcana* of anatomy and physic, much real mischief is done by their attempts at refinement, or adoption of what is to surprise by its intricacy and the difficulty of its application. The cure of these incurvations of

the spine is to be effected by the simplest means; but it is sometimes more difficult to convince the bulk of mankind of the efficacy of these, than to persuade them to adopt complicated measures, which, although some of them may have the appearance of ingenuity, will eventually lead to worse results than even the continuance of the disease which they were proposed to remedy.

In the statement of these opinions, I may possibly be opposed by those who are interested in the use of instruments, whether invented by stay-makers, or by men supposed to possess anatomical knowledge. Should that be so, my only answer would be, Before instruments are applied to relieve one part of the body, let those who recommend them assure themselves, by carefully studying the whole human fabric, that they will not be productive of injury to other and perhaps more important parts; and let those to whom they are to be applied ascertain whether it would not be better to adopt natural means of cure, than to shackle nature by the use of the crude inventions, recommended by perhaps a well-meaning person, but one who is not sufficiently instructed in the nature of the human frame.

The use of the cold and shower bath will aid the effect of the above treatment. In children, a large towel dipped in cold spring water, and allowed to fall from the top of the back part of the

head to the lower part of the trunk, will answer as a good substitute for the bath. The patient should be immediately afterwards well dried, and gentle friction used for some little time on the skin, in the direction of the spine. The internal use of the preparations of steel is often serviceable. So far as my own experience goes, I have found the ferrum ammoniatum, on the whole, more useful than any other preparation of that substance.

ON ABSCESES OF THE HIP-JOINT, AND ON INCUR-  
VATIONS OF THE SPINE FROM CARIOUS VERTE-  
BRÆ.

THE suppuration and ulceration of the hip-joint form a disease which is so frequent in its occurrence, is attended with so much derangement of the natural motions of the body, is so painful in its duration and dangerous in its consequences, that I feel justified in calling your attention to its particular effects on the form and motion of the skeleton.

Diseases of the hip-joint, not arising from some obvious accidental cause, are generally considered to be of a scrofulous nature. Ulcerations of the parts composing this joint, certainly occur more frequently in people whose habits are scrofulous, than in any other ; but they may arise and be carried on, without producing any marked symptom of being scrofulous, or the person in whom they occur having been predisposed to that disease. More generally, however, the disease has a scrofulous character in the constitutional symptoms it produces, as well as in its local effects.

A slight accident in a habit predisposed to this disease, may excite it to action when it

otherwise might have remained dormant, and may do this at periods of life when scrofulous action does not usually appear.

Disease in the hip-joint has generally made some progress before the aid of the surgeon is required; and even then, from the thick mass of muscle surrounding the cavity, the extent of its progress cannot be ascertained by the touch, and therefore it can be judged of only by careful attention to its peculiar symptoms.

It is not confined to those periods of life when scrofula usually makes its attacks; it will occur at all periods, but much more frequently before than after that of puberty.

It often forms a very complicated disease; for the soft parts suffer much from the length of the course that the matter must take to reach the surface of the body; so that fistulous passages are not unusually found forming communications with various other structures, and leading to various different parts of the surface of the body from the remains of this important joint, the cavity of which is frequently obliterated, or filled up, with a diseased mass of organized matter.

On dissection, the appearances met with will be found to vary more in circumstances marking the extent of the disease, than any real difference in its nature.

In an early state the articular cartilages ap-

pear abraded in some parts, and absorbed in others; the ligaments appear to be more vascular in some places and thickened in others; the synovial membrane is lined with coagulable lymph adhering to it in different degrees of thickness: this substance also lines the acetabulum, and is often spread over the head and neck of the femur. As the disease proceeds, the articular cartilages are completely destroyed, both on the head of the bone and in the socket; the bare surfaces of the bones now become carious and ulcerate; the socket is widened and rendered more shallow by this process, and the head and neck of the femur is lessened, so that the parts composing the joint no longer are fitted to each other in shape. The ligamentum teres ulcerates, and is in time completely absorbed; the remaining part of the head of the bone is soon displaced, and by the action of the muscles is drawn upwards and lodged on the dorsum of the ilium, thus producing a dislocation from an internal cause: this effect was known to the ancient medical practitioners, but the cause of the displacement of the bone they seem to have been unacquainted with. Cases are said to have occurred where the upper extremity of the femur, when dislodged from the acetabulum, has been drawn downwards and inwards on the foramen ovale, and has remained there. I have seen no instance of this kind in a

living body, nor have I met with any preparation showing that it had ever happened.

The edge of the acetabulum formed by the ligamentous cartilage is absorbed; the purulent matter, thrown out in the joint, passes through ulcerations of the thickened and diseased capsular ligament, forming often long sinuses or large abscesses before it reaches the surface: sometimes these open on the nates, sometimes in the groin, and not unfrequently on the upper part of the thigh. Ulceration will occasionally extend through the bottom of the acetabulum, and the matter formed pass into the pelvis, where it descends and produces fistulous openings by the side of the anus; and it has been occasionally found to work its way by ulceration into the rectum. Pieces of exfoliated bone will now and then be discharged through the openings of the abscesses: but this is far from being so usual as in ulcerations of the joint of the knee.

In the latter stages of this disease, the acetabulum is sometimes filled up by a whitish organized substance of various degrees of hardness in different cases, and in different parts in the same case; all distinction between the synovial membrane, the capsular ligament, the cellular membrane, and this new substance, seems to be lost, the whole being converted into a similar mass. The muscles become much wasted, and lose their distinctness; the hip, therefore, of the

affected side is much less prominent, or rather much flatter than the other, and is often intersected by sinuses discharging very fetid purulent matter.

In cases where a curative process appears to have begun, organized coagulable lymph is found between the bony surfaces which have lost their articular cartilages, thus forming the connecting medium through which ankylosis takes place. The upper part of the femur becomes in this manner united to the surface of the os innominatum on which it happens to have been placed, and the acetabulum is filled up, partly by newly formed soft matter, and partly by the adhesive ossific inflammation occasioning the deposition of some osseous matter in particular places.

In some instances, after the cartilaginous crusts have been removed from the acetabulum and the head of the femur, these parts of the bones have ankylosed, without the femur having been dislodged from the joint. In one instance I have shown, in another part of these lectures, an ankylosis taking place between the pelvis and femur without ulceration, the articular cartilages even remaining, but appearing to be much compressed.

The great extent to which the disease is carried, and the long and painful sufferings of the patient when it goes on, form strong inducements for every surgeon to become as well acquainted

as the nature of the disease will allow of, with the symptoms produced by it at its commencement, so as to attack, and endeavour to arrest its progress before it extends beyond the powers of our art.

Some diseases affect the constitution, so as to produce much alteration in many of the general actions of the body previously to their appearance in some local form; we have examples of this in the small pox and measles, where fevers exist before the eruptions take place. But this is not so in scrofula, for local effects take place first, and the constitution suffers apparently from their occurrence, and does this in proportion to the importance of the parts, and the number of structures affected.

Thus the first symptoms of a local scrofulous affection, not being attended with much pain, are often disregarded, and the disease allowed to make a certain progress before attempts are made to check it; or the attempts made, are only those which might effect its cure by strengthening the constitution. The disease in the hip-joint is in this way often overlooked at first, and no local treatment had recourse to until it has made considerable advances.

Although this disease often begins without much pain, as it proceeds, this symptom gradually comes on and increases to a great degree of vio-

lence. The constitution of the patient is seldom much affected at first; but frequent fits of languor take place, relieved occasionally by those of cheerfulness; the languor, however, increases and becomes more constant, the countenance becomes pale, the desire for exercise becomes less, and when the attempt is made to walk, a degree of lameness (that usually called limping) is perceptible, which in children is often mistaken for an acquired awkward gait. The pain is not always referred at first to the hip-joint, it is often referred to the loins and groin; and as the disease advances, to the upper part of the thigh, the inside of the leg, or to the heel; but by much the most frequently to the knee. Occasionally the pain is referred to both the hip and knee; but that felt in the knee is usually described as the most severe of the two. Sometimes it is referred to the knee only, and is felt there so violently, that the patient and the relatives are with difficulty persuaded that the knee is not the situation of the disease. Many instances have occurred even of medical practitioners mistaking its seat, and without even suspecting that the disease was in the hip, all their remedies have been directed to the knee. The limb is subject to occasional startings during sleep; and the sufferer often expresses the intense degree of pain these occasion, by sudden and involuntary screams, referring the agony

chiefly to the knee: notwithstanding this, when the knee is examined, the only appearance of alteration is, sometimes, but that not often, a little puffiness of the skin, which may arise from the patient constantly applying his hands to the part. The thigh and leg, when compared with those of the opposite side, will now be found less in circumference in their muscular proportions.

The limb, to the feelings of the patient, and to the eyes of a casual observer, will seem to be elongated, so that the patella, when viewed in the standing position of the body, shall not be in a line with the one of the other knee, but will be the lowest; it will also appear so at first, when the patient is placed horizontally on his back, unless the straight position of the pelvis is particularly attended to. The supposed elongation of the limb has been attempted to be accounted for, by the head of the femur being pushed downwards by the substance which in this disease sometimes fills up the socket; but if pressure took place from this cause, it would be outwards not downwards. The limb, in point of fact, is not lengthened; but appears to be so from that side of the pelvis being depressed. This appearance of depression is produced by the positions of the sound and affected limbs when the person is standing; the principal weight of the body, to avoid pain, is then thrown upon the sound limb and borne by it when extended, while the disease thigh is car-

ried forwards, and the knee bent. In this position, to permit the foot to touch the ground, the pelvis of that side must be lowered in proportion to the bending of the two joints of the thigh and leg; the spine is concerned in allowing this, and is, of course, a little bent, and when ankylosis of the hip-joint takes place, it retains this bend; but previous to ankylosis, this curve of the spine may be remedied in a few days, if the patient is confined during that time to the horizontal posture.

The thigh early in this disease is usually bent forwards, and the knee is also kept in the bent state, the patient feeling most ease when the limb is in that position; and after some time, the weight seems rather to be supported on the toes, than on the flat sole of the foot. It is, therefore, the trunk, bending towards the affected side in walking, that produces the limping which so constantly attends this disease.

When weight is borne on the limb, the pain is greatly increased; so is it when, in the horizontal posture, the femur is pressed without bending against any part of the acetabulum, particularly when pressed upwards; for the articular cartilages or the surfaces which they originally covered, are then made to press on each other; and when ulceration has taken place, this pressure always produces much pain. The pain is not

found to be so great, on pressure being used, before ulceration has began.

As the disease goes on, any attempt to extend the thigh is attended with violent pain.

A great degree of tenderness takes place in the groin, and the absorbent glands in general enlarge. The symptoms, having proceeded thus far, will sometimes remain stationary for weeks or even months, indeed will sometimes appear to subside; when suddenly, and without any apparent cause, they shall be reproduced, and shall be carried on with greater violence than before.

From the ulceration of the head of the femur and of its socket, the bones cannot remain in their natural situation; for, from the action of the muscles, what remains of the head and neck of the femur, no longer being retained by the acetabulum, is drawn upwards, and rests on the os ilium above that cavity. The toes will in general in this state incline outwards, if much absorption of the bones has taken place: but if the thigh has been much bent, and the neck of the bone but little shortened, as in other dislocations, the toes will be inclined inwards. When the os innominatum has been much diseased, it has happened that a portion of the edge of the acetabulum has been broken off, and carried upwards with the femur.

Suppuration of the cavity of the joint some-

times precedes the shortening of the limb; but this shortening frequently takes place before the matter is felt under the skin. In some instances the limb has become shortened and ankylosed, without any apparent suppuration. After the shortening, however, matter usually forms, and, in the manner formerly mentioned, works its way to different parts of the surface of the body, but most frequently to the skin covering the outside of the upper portion of the *vastus externus* muscle. Pus tolerably well formed is sometimes discharged at first, but afterwards the discharge becomes thin, bloody, and fetid. At other times a thin fluid issues out with solid matter floating in it. The fluid is occasionally, but not often so, in this joint, viscid and glairy.

Dissections of these diseased joints, with histories of their respective cases, have been published, and can be referred to in the valuable works of Russell, Crowther, Ford, and Brodie, and which render it unnecessary for me to give the history of any particular dissection, although many, from the length of time I have been engaged in teaching anatomy, must have come under my own observation.

Several of the remarks which I have already made in another part of the Lectures on the ulceration and suppuration of the joints generally, will apply to the treatment of those actions when

occurring in the hip; others will not so well apply, for example, from the great thickness of muscular flesh between the cavity of the hip-joint and the surface of the body, the cold evaporating lotions are not likely to prove so useful in checking the disease, as they are found to prove in joints which are more thinly covered.

When inflammation of an active kind takes place in the joint, or in the parts contiguous to it, and is attended with painful throbbing, quick pulse, and much preternatural excitement of the whole system, bleeding by leeches, or cupping from the vessels near the joint, or even bleeding from the arm when the patient's constitution is tolerably strong, will often be productive of temporary relief; but bleeding alone will not be sufficient to cure the ulceration which has began in the joint. In the early stage of the disease, the occasional use of the warm bath will sometimes be attended with alleviation of the pain.

In this disease, under any circumstances, the most perfect quietude that can be obtained should be given to the joint; for all motion must necessarily tend to increase the disease when ulceration is going on, and to prevent ankylosis from being completed when the curative process has began. Every surgeon will consult his own judgment how that quietude can be procured, and recommend the means to his patient. The horizon-

tal posture will of course be the position chosen for the patient to remain in; and all sudden motion from contraction of the muscles should be carefully guarded against.

It must be recollected, that the limb will prove more useful if the thigh is not bent; it will be impossible indeed to keep it constantly and perfectly extended, nor is it necessary to attempt this; but attention should be paid to prevent it from being much bent; for an ankylosis in that position of the limb would not only produce deformity, but the difficulty and inconvenience in progressive motion would be greatly increased.

Blisters repeatedly applied, or kept open by some stimulating cerate, will often be attended with much good effect in stopping the progress of and even in curing the disease. They can be applied to every part of the surface of the skin surrounding the joint, but the nearer they are placed to the cavity, the more useful are they generally found to be. I have also found that blisters applied to the loins, the inside of the thigh and to the knee, have sometimes procured sudden relief to pain which before was excessive.

Next to keeping the joint perfectly at rest, our greatest dependance for a cure rests on the effect of setons, or issues produced by caustic applications to the skin, as near as possible to the cavity of

the joint. My own observation agrees with that of Mr. Ford, that the nearer they can be applied the more certain is their effect. These setons may be inserted, or the issues by caustic made, either in the hollow behind the trochanter major in the hip, or in the groin, or in both. Setons, in the groin, are preferable to caustic issues.

I shall not here discuss the question, whether the advantage derived from setons and issues, proceeds from the counter irritation, or from the drain which is established. They certainly on many occasions have been found to give relief before suppuration had taken place in the part. It is possible, however, that they may be persevered in beyond the period of their doing good; and, therefore, in those cases where manifest advantage arose from them at first, when, although the joint has been kept in a state of perfect rest, the symptoms of the disease re-occur, it is often necessary to discontinue their application. In several instances, I have known that the progress of the disease has been again arrested by their removal.

A gentleman, about twenty-four years of age, had complained for nearly two years of a pain, sometimes in the joint of the hip and sometimes in that of the knee, and which latterly had increased in the hip to that degree of violence that he could not suffer his foot to touch the ground. I recommended perfect rest in the horizontal posi-

tion, and introduced a seton into the groin; I also applied a caustic behind the trochanter major. In seven weeks all pain had left him, and he gradually recovered the motion of the joint. On a slight recurrence of the pain, arising from having used too much exercise, a blister was applied to the nates; but the pain soon became so excessive in the joint that the blister could not be continued; the pain was lessened upon its removal, but did not entirely cease. The seton was then withdrawn, and the issue healed up in a few days afterwards; the pain not only ceased, but the patient has remained well ever since, and can attend to his farming concerns on horseback, for hours, without inconvenience.

In a lady about forty-five years of age, who was the mother of several children, so much pain and inability of motion occurred in the hip-joint, that she had not, when I was consulted by letter, been able to leave the horizontal position for some months. I recommended a seton to be inserted behind the trochanter major; this was done. In a few days the pain became much less. The seton after some weeks' insertion was removed, and a return of the pain soon followed. A second seton was inserted near the groin, which on its first introduction was attended with success equal to the former. It was continued for two months, and for seven weeks of that period the patient appeared to

be recovering; the seton then became violently painful; the pain also in the hip again came on, and increased to intolerable anguish; I therefore recommended the removal of the seton; and within twelve hours after its removal, the pain, both in the groin and hip, subsided. This happened about a year ago. The lady can now walk, with the help of crutches, without feeling pain; but the thigh is bent forwards, and ankylosed in that position. No fluid was felt in this case, nor did any appearance of suppuration of the cavity of the joint occur, although the symptoms strongly marked an absorption of the articular cartilages.

I have stated that it was not my intention in these discourses to dwell on the treatment of particular cases; I have, therefore, no other remarks to make on abscesses arising in the hip-joint, beyond what I have already made last summer, when on the subject of suppuration generally, and when on the formation of matter in the cavities of joints in the recent Lectures of this course.

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#### ON CURVATURES OF THE SPINE FROM CARIOUS VERTEBRÆ.

When on the subject of rickets, many specimens were produced exhibiting the effect of that disease on the vertebral column in occasioning la-

teral deviations from its natural shape. Curvatures of the spine may also arise from the bodies of the vertebræ becoming carious and being absorbed, and from the disease and destruction of the intervertebral substances. When this happens, the effects are usually found to extend to the ligaments, spinal marrow, and nerves contained within the vertebral canal, and thus to produce symptoms very different and distinct from those which arise from caries of other bones.

Many very excellent observations on the caries of the spine and on its consecutive symptoms, are before the public; and to the late Mr. Percival Pott we are very greatly indebted for the very clear and comprehensive view he has taken of it in its origin and progress, and also for the means of arresting its dreadful course, with which, in his peculiarly interesting treatise, he has made the world acquainted. It is therefore unnecessary for me to enter further into a description of its symptoms and treatment, than the production of the preparations from our museum, illustrative of the altered structure of the spine and its contained parts, will naturally suggest.

As caries of the bodies of the vertebræ may take place in every period of life, incurvations of the column, formed by them, occur in old as well as in young people; but from the greater degree of firmness in the joints of the articulating pro-

cesses, and the stiffness of the muscles and ligaments, the bend in the spines of people advanced in life is more rare, and when it does occur, is less extensive, than when caries affects the vertebræ of those who have more lately commenced their career in life.

Unlike to the curvature of the spine from rickets, in this disease there is but one bend, and this is almost constantly forwards, the projection of the curvature or hump is, therefore, backwards, and is made by the spinous processes of the vertebræ. The bend is sometimes so great, that the margin of the chest is brought down to that of the pelvis. It does now and then happen, that from the same side of the bodies of one or two contiguous vertebræ being more extensively destroyed than the other, the bend has some lateral inclination.

From the repeated dissections which have been made of the parts affected by this disease, it appears that it is much connected with scrofula, and that it arises more frequently from a constitutional taint of that character, than from any local injury done to the spine.

Patients are generally willing to attribute it to some accident or injury, not unfrequently to some sprain; but it will often arise without any discoverable reason. A sprain is not, however, unlikely to call a scrofulous disposition into action,

which might otherwise have lain dormant. In some cases where it has seemed probable that the caries arose from a local injury, certain symptoms of its being present, such as loss of power in the lower extremities, have not occurred until four or five years after the accident.

The disease is supposed to begin generally in the bodies of the bones, and sometimes to originate in the intervertebral substances, for, as it proceeds, both of these parts are affected; but it may begin in some of the structures situated within the theca vertebralis, and spread from thence to the bones, and to the soft parts connecting them.

When the disease begins within the theca vertebralis, the loss of power in the parts below its seat may take place, without any curvature of the spine. From the difficulty of bringing the spinal marrow into view, particularly when bodies are opened privately, it must often happen that the appearances of disease beginning in the theca vertebralis are not sought after, or are perhaps overlooked. In several instances I have met with scrofulous tumours in the spinal marrow, some of which have been confined to its substance, and others have affected the ligaments also. The two specimens, which I now place before you, are very well-marked instances of these scrofulous tumours, and would, from the destruction of the spinal marrow, produce those symptoms of paralysis,

which are usually attributed to the diseased and bent state of the bones of the spine. As this disease may take place in various parts of the vertebral column, some of the symptoms attending it will depend upon its situation being higher or lower. I have seen these tumours in every part of the spine, from the middle cervical to the lowest lumbar vertebra.

If the parts are examined on the death of a person, in whom previously the disease was going on, a thick and confused mass of organized soft substance will be found before and on the sides of the bodies of the vertebræ; when this is cut into, it usually contains a quantity of thick curdy scrofulous matter, mixed in some places with common pus; the inner surface of the cavity containing this matter is generally irregular, and the ligaments of the vertebræ seem to have been concerned in its original formation; but all accurate distinction of parts is lost in the thickened mass. In some cases the bodies of several vertebræ will be found to have become softer and more spongy, also more red and vascular than usual; but not enlarged. Early in the disease, ulceration will be seen beginning in their bodies, either on the fore part or on the sides, and, occasionally, at some little distance from the inter-vertebral substance, as in the preparation now before us. In other instances the inter-vertebral substances will be seen

separating from the carious surfaces of the bodies of the vertebræ, and sometimes these substances will appear to be thickened and projecting; but this may in part arise from the diminished size of the bodies of the bones. Occasionally the whole of the bodies of some of the vertebræ are removed, their articulating, transverse, and spinous processes remaining; the spine under these circumstances bends forwards, and forms a greater or lesser angle according to the number of the bodies of the vertebræ which have been destroyed. In elderly people, I have seen instances of a large proportion of the bodies of several vertebræ having been destroyed without much, if any, curvature having taken place; a deposition of ossific matter had adhered to the outside of the remaining parts of the bones, sufficiently large and firm to prevent the bend, the inter-vertebral substances had also been destroyed, and the spaces formerly occupied by them were filled up with curdy matter.

I have frequently seen the inter-vertebral substances thickened, and with such marks of vascularity, that I cannot doubt of ulceration occasionally taking place in them. There are instances before us, where several of these substances and the contiguous bones have been destroyed and removed. These inter-vertebral substances have at all times much more vascularity than inter-articular or articular cartilages.

In the latter stages of the disease, no trace remains of what structure it began in; bones, ligaments, and intervertebral substances having been removed, and a mass of scrofulous matter substituted in their places.

Caries of the bodies of the vertebræ will take place in persons who have no scrofulous taint, when such vertebræ have been long exposed to an unnatural pressure; thus tumours of various kinds, but more particularly aneurismal swellings of the aorta, by pressure on the spine, have frequently produced this disease. In the preparation now before us, the bodies of several of the dorsal vertebræ have been destroyed from this last-mentioned cause.

Caries of the vertebræ may also exist for months, or even for years, without producing incurvation of the spine; and when incurvation does take place, if it proceeds slowly, a very considerable degree of it may occur without affecting the spinal marrow so as to produce a loss of power or of sensation in those parts of the body, which receive their nerves from below the seat of the disease. I have seen instances where, from the bend, the anterior and inferior margin of the thorax has been brought nearly in contact with the anterior and superior margin of the pelvis, and where, notwithstanding, neither sensation nor voluntary motion in the lower limbs have

been much impaired, certainly not more so than would have arisen from the body being long retained in an unnatural position. It is not unusual to meet with persons, who, though much deformed by incurvations of the spine forwards, not only enjoy good health, but are also capable of using very considerable exertion in standing or walking, without experiencing any material inconvenience, or suffering greatly from fatigue.

We have before us several specimens of two, three, four, or even more vertebrae, the bodies of which have been completely destroyed, whose processes have ankylosed with each other and with the bodies of those vertebrae that were situated above and below them; which bodies, although originally placed far apart, from the destruction of those intermediate and from the bend, have arrived in contact with, and become firmly connected to each other by bony union, as well as to the processes of those, the bodies of which were destroyed.

When disease originates in the spinal marrow, or spreads to it from the surrounding bones and ligaments, or when so much morbid matter is formed as to produce partial or permanent pressure on it, then symptoms either of derangement, or of complete loss of sensation and voluntary motion, will take place in all those parts whose nerves

come off from below, or are connected with the affected part of the spinal marrow.

Symptoms of this nature generally take place gradually; but sometimes from the bones giving way at once, either a portion of detached bone or cartilage, or some of the accumulated scrofulous matter, may suddenly be driven on the spinal marrow, and so compress or injure it, as to bring on these symptoms immediately. If the incurvation takes place slowly, the spinal marrow will always adapt itself to the bent state, and none of its functions will be injured or lost. In every case of which I have known the history, that I have examined after death, where the nerves have been affected, such affection has been found not to arise from the curvature of the spinal marrow in consequence of the bend of the bones, but either from some morbid alteration of structure in its substance, or from some of the accumulated matter, or from a portion of some dead and detached bone pressing on it.

Caries of the vertebræ may exist for months without matter being necessarily formed, or without producing incurvation of the spine, the only symptoms produced being great lassitude of motion, and a heavy dull pain felt near the seat of the disease.

When suppuration does take place from caries on the anterior part, or the sides of the bodies be-

longing to the lower dorsal or to the lumbar vertebræ, the adhesive inflammation, which takes place on the surfaces nearest to the cavity of the abdomen, thickens, and thus strengthens the boundary between the abscess and the peritonæum, so as to prevent the matter from bursting into the cavity. The matter as it accumulates generally works its way downwards in the direction of the psoas muscle, and appears first in the groin; or sometimes in the upper part of the thigh, forming the psoas abscess. On some occasions, the matter has taken the course of the spermatic vessels, and has passed through the ring, so as to be mistaken by careless observers for inguinal herniæ. In other instances, the matter has extended round to the loins, and the tumour opened behind, forming the lumbar abscess.

When disease affects the spinal marrow, characteristic symptoms of the paralytic kind will often take place before any curvature of the vertebræ is perceptible, and the pain in the beginning of the disease cannot always be referred to any decided part of the spine; indeed even when well marked symptoms of the existence of the disease have taken place, the part cannot always be discovered either by the sight or touch. In general, however, although there may be no perceptible projection of the spinous processes, the affected part will feel more tender to the touch; and it has

been observed by Mr. Copeland to be more susceptible to the stimulus of heat, so that a sponge wetted with warm water, and drawn over the skin in the direction of the spine, will be felt so much, as to give pain when it passes over the diseased part. Should there be any projection, this will be more easily discovered when the patient bends the body forwards, than when the spine is examined in the erect attitude.

The symptoms of incurvated spine have been very often and very accurately described; and to Mr. Pott we are indebted for a masterly delineation of those circumstances which mark the difference between symptoms produced by the effects of the disease on the spinal marrow, and those which arise in a true paralysis. I shall here only observe, that in a true paralysis the muscles are soft, they have a flabby feel, and scarcely seem to have a disposition to contract; the joints, upon external force being applied, are easily moved in every direction; there is no rigidity or stiffness in the limbs, nor any disposition for them to be drawn in one direction more than in another. But when the disease arises in the bones, and affects the spinal marrow, although from want of exercise the muscles are shrunk, they are much firmer to the touch, and appear to be more in that state of contraction into which their tone would throw them. In consequence of this the

knees and ankles are stiff, and the legs and thighs are often rigidly retained in a particular position: this may be either straight or bent. The foot is generally extended, so that the heel is drawn up and the toes pointed downwards; this last, indeed, forms a very characteristic symptom of the disease.

Its first attack is often attended, by the patient (either child or adult) becoming languid and very soon tired if obliged to stand or walk. He is observed also frequently to stumble or trip. The legs are often involuntarily drawn across each other, so that the person is thrown down; the knees totter and bend under the weight of the body, and he finds that he cannot, with any precision or certainty, give his feet a determined direction; he feels also a want of power in bending the body backwards; when in bed, he finds a difficulty in turning, and when seated, the legs are almost constantly drawn across each other. When the pressure is in the neck, the head cannot be supported, therefore is generally leaned on a table or chair; the arms are also affected, so that numbness and loss of voluntary motion, to a greater or lesser degree, take place in them; and there is much difficulty of breathing.

When the disease affects the dorsal vertebræ, the abdominal muscles become paralysed, so that laborious respiration takes place, accompanied with

a hard dry cough ; a tightness is felt about the stomach, and the patient usually describes a sensation as if a band was tied tight round the belly ; this is attended with loss of appetite, a quick pulse, and hectic fever. There is great coldness of the limbs, with a constant heavy dull pain in the part, and the power ceases of retaining or discharging the urine or fæces according to the will ; and sometimes all sensation and voluntary motion in the lower limbs will be lost, and continue to be so for some time before the patient is relieved by death. But as death is not the inevitable consequence of the disease, we are encouraged, in almost every case, to try those means of cure which have proved successful in many instances.

The medical treatment must be regulated by the symptoms which mark some derangement in those actions on which life is found to depend, as those of the heart, lungs, stomach, intestines, or bladder, so as to assist the local remedies, which are those to be chiefly depended on in the cure of the disease.

It is obvious, that the horizontal posture is less favourable than any other to the progress of the disease, and therefore the patient should be strictly confined to such posture \*.

\* A couch has lately been invented by Mr. Earle, by using which many of the inconveniences attending the long confinement to the horizontal posture may be avoided.

Although instruments, which would act by extending the spine, would prove highly injurious if applied when ankylosis was likely to take place; yet if any can be applied while the disease is advancing, so as merely to assist in supporting weight, they may certainly prove useful, in so far, that they will prevent diseased surfaces pressing so much on each other as when no instruments were used. Much judgment, however, will be required in the choice, and in the application of them. When ankylosis is likely to happen, they should be discontinued, and the horizontal posture should be constantly persevered in; for, although a deposition of bony matter will take place round the ankylosed surfaces of bone, the bodies of the destroyed vertebrae are never renewed.

In almost every stage of this disease I have witnessed very favourable effects from caustics applied, or setons introduced on each side of the projection of the spine. It must be owned, however, that sometimes we are disappointed in the benefit we have had reason, from the result in other cases, to expect from them; but we have no other means of cure so certain, and that they are not specifics in the cure, should not be urged against a fair trial being given to them. In one of the most unpromising cases for which I was ever consulted, where a child of five years old

was bent nearly double, where the limbs had become useless, and the power of retaining the urine and fæces had been lost, and in fact where death was daily expected, by the suggestion of Doctor Baillie I applied extensive caustics on each side of a projection made by the middle dorsal vertebræ, and in six weeks after that period the child was able to walk round the room with the help of two sticks; in two months to walk half a mile on crutches; and in less than six months, no disease nor any inconvenience more than what arose from the curve remained. The person is now alive, although seventeen years have elapsed since the use of the caustics, and has had during that time uninterrupted good health. I mention this as a case remarkable for the degree of health the person has enjoyed. I could relate several others, where the caustics or setons have proved successful, but many of such cases have already been published in various works.

When matter forms, and works its way to the groin, to the upper part of the thigh, or to the loins, and then bursts through the skin, all that we can do is to let the orifice heal as soon as possible after the pus has been discharged, and to open the abscess by a puncture with a lancet when it again points, or to evacuate the matter through the canula of a small trocar: no good

can arise in such case from any extensive opening, nor will the abscess heal permanently until the disease in the bone is cured.

THE END.

WORKS BY MR. WILSON,  
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